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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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RICK MARTIN PATENT LAW OFFICES OF RICK MARTIN, PC 416 COFFMAN STREET LONGMONT, CO 80501			MCDONALD, RODNEY GLENN	
			ART UNIT	PAPER NUMBER
			1753	

DATE MAILED: 05/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/085,312	Applicant(s) SUNTHANKAR ET AL.	
	Examiner Rodney G. McDonald	Art Unit 1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 9-15, 18, 19 and 22 is/are allowed.
- 6) ☒ Claim(s) 1, 7, 16, 20, 21 and 23-29 is/are rejected.
- 7) ☒ Claim(s) 2-6, 8 and 17 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>2-28-02</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 7, 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Vergason (U.S. Pat. 5,037,522).

Vergason teach a "toggle switch" 60 (***The toggle switch feature of the claims***) in Figs. 1 and 2. The "toggle switch" comprises a cathode 16 (***The cathode feature of the claims***) having a plurality of contacts in the form of terminals 64 and 68 (***The plurality of contact nodes feature of the claim***). The terminals are connected to negative poles through switching circuit 60 from a negative DC voltage output. The switch circuit acts as a "switch" to connect the negative pole of the DC voltage to each terminal 64 and 68 in a time sharing mode. (***The switch feature of the claims***) In Fig. 2 for example a first sensor 28 senses the approach of the arc spot, the first flip flop 80 will be set and cause the power switch 90 to connect the negative side of the power supply 58 to the second end 27 of the cathode 16, while a short time period later as determined by the gate delay of the buffers 84, the second flip-flop 86 will be reset and cause the power switch 92 to disconnect the negative side of the power supply 58 from the first end 26 of the cathode 16. Similarly, a signal from the second sensor 29 causes the power switch 92 to connect the first end 26 of the cathode 16 to the power supply

Art Unit: 1753

58, and then causes the power switch 90 to disconnect the second end 27 of the cathode 16 from the power supply 58. **(The time sharing frequency controller feature of the claims)** The overlap period caused by the gate delay of the buffers 84 and 88, during which both ends of the cathode 16 are connected to the arc power supply 58, insures that there will be no interruption of the connection to the cathode 16 which could cause extinguishment of the arc. **(The time sharing mode feature of the claims)** An anode 14 is present. **(The anode feature of the claims)** (Column 3 line 57; Column 4 lines 60-68; Column 5 lines 1-50)

Claim 25 is rejected under 35 U.S.C. 102(b) as being anticipated by Sablev et al. (U.S. Pat. 3,793,179).

Sablev et al. teach in Fig. 4 a cathode 77 **(This is understood to be the target material for depositing from)** attached to a cooling bed 78 **(This is understood to be the cathode)** for arc discharge evaporation. The whole of the non-evaporation surface is closed with a metal shield 82. **(This is understood to be an anode with respect to the cathode since it is a floating metal shield)** The shield is provided with a slot 83 through which a trigger electrode 84 passes towards the surface of the cathode 77. (Fig. 4; Column 13 lines 32-38; Column 13 lines 60-63) A gap exists on the backside of the cathode to the metal shield 83. An arc moves along the surface of the cathode. (See Figure 4)

Claim 29 is rejected under 35 U.S.C. 102(b) as being anticipated by Iwama (JP 05-009722).

Iwama teach a target 2 for mounting on a backing plate 3 (i.e. cathode) with the backing plate being provided with a DC voltage. The **target 2 has concentrical grooves 2a** and the magnets are provided on the rear surface of the target 2 between these grooves 2a. (See Japio Abstract) The shape of the target solves the problem thickness distribution across a substrate and step coverage on a substrate. (See Machine translation paragraph 0008) **(This is understood by the examiner to be the focus aspect of Applicant's claims since it controls film formation thickness on the substrate, which is directly related to vapor flux.)**

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Christy (U.S. Pat. 5,895,559) in view of Munemasa et al. (U.S. Pat. 5,269,896)

Christy teach in Fig. 1 a target 101 and an anode. In accordance with the invention the target 101 is manufactured from the coating material and is evaporated by the arc. The target 101 is placed on the cathode body 118, which serves to hold the target 101, providing cooling and electrical connections to the target 101. (Column 3 lines 31-37) An insulation ring 102 encompasses the cathode body 118, preventing the arc from reaching the cathode body 118 as well as insulating the cathode body 118 from the chamber walls 109. The insulation ring 102 is in close proximity, but not adjacent to, the cantilevered lower side of the target 101. The insulation ring 102 is separated from the target 101 by a gap 112. The gap 112 prevents the arc from reaching the cathode body 118 by eliminating any path for the arc to travel along. (Column 3 lines 42-50) In Fig. 1 a gap also exists between the cathode 118 and the insulation ring 102. (See Fig. 1) The underside of the cathode body 118 is electrically insulated through use of a plastic block 103. The plastic back 103 extends beyond the cathode body 118, allowing for sufficient clearance in which to mount the insulation ring 102. The plastic back 103 further provides insulation between the cathode assembly and the chamber wall 109. (Column 4 lines 5-10) Figure 4 illustrates an alternate embodiment to the instant invention wherein the insulator 402 is extended to be parallel with the ends, and flush with the top surface of the target 401. The insulator 402 and target 401 are separated by the gap 412 to maintain the arc on the target 401. (Column 4 lines 62-66) In Fig. 4 there is a gap between the cathode and insulator 402. (See Fig.

4) The "C" shape of the insulator body in Figs. 1 and 4 comes from ring 102 or 402 in combination with plastic member 103. (See Figs. 1 and 4)

The difference between Christy and the present claims is an adjust mechanism to move the ring as the cathode erodes.

Munemasa et al. teach a shield moving mechanism as seen in Fig. 2 that the height of the upper edge of the shield is identical with the height of the evaporation surface. (Column 5 lines 10-19; Fig. 2)

The motivation for providing a moving mechanism to move the shield identical to the height of the evaporation surface is that it allows for maintaining stable arc discharge without causing arc disconnection. (Column 6 lines 11-15)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Christy by utilizing a moving mechanism for a shield as taught by Munemasa et al. because it allows for maintaining stable arc discharge without causing arc disconnection.

Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vergason (U.S. Pat. 5,037,522) in view of Morrison, Jr. (U.S. Pat. 4,724,058).

Vergason is discussed above and all is as applies above. (See Vergason discussed above)

The difference between Vergason and the present claims is that the cathode having a back side with the magnets mounted on the back side is not discussed.

Morrison teach a method and apparatus for arc evaporating. (See Morrison Abstract) In Fig. 4 Morrison teach a target 12 with cathode 26 having cooling channels

22 and mounted on the cathode 26 is a magnetic means comprising an iron plate 28 with coils 32. (See Figure 4; Column 4 lines 34-44)

The motivation for utilizing magnets mounted to the back of a cathode is that it allows for evaporating large area targets. (Column 1 lines 59-61)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Vergason by mounting magnets on the backside of the cathode as taught by Morrison, Jr. because it allows for evaporating large area targets.

Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vergason (5,037,522) in view of Pinkhasov (U.S. Pat. 4,609,564)

Vergason is discussed above and all is as applies above. (See Vergason discussed above)

The difference between Vergason and the present claims is that the pulsing of the current is not discussed.

Pinkhasov teach that the arc current can be provided by a pulsating direct current source. (Column 8 lines 60-65)

The motivation for utilizing a pulsating direct current source is that it allows for high speed coating. (Column 3 lines 38-30)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Vergason by utilizing a pulsating direct current source as taught by Pinkhasov is that it allows for high speed coating.

Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vergason (U.S. Pat. 5,037,522) in view of Sablev et al. (U.S. Pat. 3,793,179).

Vergason is discussed above and all is as applies above.

The differences between Vergason and the present claims are that the anode member is not discussed with the gap.

Sablev et al. teach an anode member with gap as discussed above. (See Sablev et al. discussed above)

The motivation for utilizing an anode member with gap is that it allows for having arc burning take place mainly on the cathode surface. (Column 14 lines 6-7)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Vergason by utilizing an anode member with gap as taught by Sablev et al. because it allows for having arc burning take place mainly on the cathode surface.

Claims 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vergason (U.S. Pat. 5,037,522) in view of Sablev et al. (U.S. Pat. 3,793,179).

Vergason is discussed above and all is as applies above. (See Vergason discussed above)

The difference between Vergason and the present claims is that the depositing on the outside surface of the workpiece with the workpiece disposed inside the cylinder target is not discussed.

In Fig. 6 Sablev et al. teach depositing on the outside of the workpiece with the workpiece disposed inside a cylinder target. (See Fig. 6; Column 14 lines 44-47)

The motivation for depositing on the outside of a workpiece inside a cylinder target is that it allows for depositing on cylindrical bodies. (Column 14 line 39)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Vergason by depositing on the outside of a workpiece inside a cylinder target as taught by Sablev et al. because it allows for depositing on cylindrical bodies.

Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vergason (U.S. Pat. 5,037,522) in view of Sablev et al. (U.S. Pat. 3,793,179).

Vergason is discussed above and all is as applies above. (See Vergason discussed above)

The difference between Vergason and the present claims is that the coating the workpiece disposed around the cylindrical target is not discussed.

Sablev et al. teach in Fig. 7 depositing on the inner surface of a pipe by coating from a cylindrical target with a pipe disposed around the cylindrical target. (See Fig. 7; Column 15 lines 63-64)

The motivation for depositing on a workpiece disposed around the cylindrical target is that it allows for coating the inner surface of a pipe. (Column 15 lines 63-64)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Vergason by depositing on a workpiece disposed around a cylindrical target as taught by Sablev et al. because it allows for coating the inner surface of a pipe.

Allowable Subject Matter

Claims 2-6, 8 and 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 9-15, 18,19 and 22 are allowed.

The following is a statement of reasons for the indication of allowable subject matter:

Claims 2-6 are indicated as being allowable over the prior art of record because the prior art of record does not teach the claimed subject matter including the constant contact mechanism with a rotating switch pole.

Claim 8 is indicated as being allowable over the prior art of record because the prior art of record does not teach the claimed subject matter including the current switching means further comprising a variable speed motor rotating a disc means having a conductive segment and a nonconductive segment, wherein the conductive segment alternately electrically contacts a contact node means.

Claims 9-12 are indicated as being allowable over the prior art of record because the prior art of record does not teach the claimed subject matter including wherein the rotating cathode current source contacts each fixed electrical contact hub to provide a momentary overlap of current between a pair of fixed electrical contact hubs before directing all the current to the next member of the pair of fixed electrical contact hubs, thereby causing the arc to be steered by the movement of current amongst the plurality of electrical contacts in a continuous manner without interruption.

Claim 13 is indicated as being allowable over the prior art of record because the prior art of record does not teach the claimed subject matter including wherein the rotating cathode current source contacts each fixed electrical contact hub to provide a momentary overlap of current between a pair of fixed electrical contact hubs before directing all the current to the next member of the pair of fixed electrical contact hubs, thereby causing the arc to be steered by the movement of current amongst the plurality of electrical contacts in a continuous manner without interruption; wherein the rotating cathode current source further comprises a disc having a peripheral contact edge, said edge having a conductive and a nonconductive segment; wherein the rotating cathode current source further comprises a central shaft supplying the cathode current to the conductive segment; and wherein a variable speed motor rotates the rotating cathode current source.

Claim 14 is indicated as being allowable over the prior art of record because the prior art of record does not teach the claimed subject matter including wherein the reciprocating cathode current source sequentially contacts each fixed contact hub to provide a momentary overlap of current before directing all the current to the next fixed contact hub to be contacted, thereby causing the arc to be steered by the movement of current between the plurality of cathode electrical contacts in a continuous manner without interruption.

Claim 15 is indicated as being allowable over the prior art of record because the prior art of record does not teach the claimed subject matter including a plurality of cathodes each having a plurality of electrical contacts; a switching cathode current

source to provide an arc simultaneously to each cathode; said switching cathode current source having a separate switch for each cathode; and wherein the switching cathode current source contacts a first and a second electrical contact on each cathode to provide a momentary overlap of current between them before directing all the current to the next contact in line to be contacted, thereby causing several arcs each to be steered by the movement of current between the plurality of cathode electrical contacts on each cathode in a continuous manner without interruption.

Claim 17 is indicated as being allowable over the prior art of record because the prior art of record does not teach the claimed subject matter including the cathode body being positioned within said insulator member and said cathodic arc target being positioned in electrical contact with said cathode body, a gap between the cathode body and the insulator member, and a gap between the cathodic arc target and the insulator member; said insulator member cross-section having a "C" shape, with a pair of ends aligned with a plane of the target erosion surface; said cathode body having a back side; and a magnet mounted to the back side so as to face the insulator member.

Claim 18 is indicated as being allowable over the prior art of record because the prior art of record does not teach the claimed subject matter including each cathode having a plurality of electrical contacts; a cathode current controller; said cathode current controller having a current input, a plurality of current outputs, a logic module to control desired combinations of inputs to outputs; and wherein the cathode current controller for each cathode sequentially contacts a first and a second electrical contact to provide a momentary overlap of current between them before directing all the current

to the second electrical contact, then repeating the process to the next in line to be contacted, thereby causing an arc on each cathode to be steered by the movement of the current between the plurality of cathode electrical contacts in a continuous manner without interruption.

Claim 19 is indicated as being allowable over the prior art of record because the prior art of record does not teach the claimed subject matter including the striker assembly comprising an electrically insulating solid core having a conductive outer surface; the conductive outer surface having a physical contact with the target; a switch connected between the striker's conductive outer surface and a source of a different potential than the cathode; wherein momentary closure of the switch causes a current flow through the conductive outer surface, thereby depleting the conductive outer surface and creating a spark to initiate an arc to an anode; and wherein the target re-coats the striker during a cathodic arc deposition process.

Claim 22 is indicated as being allowable over the prior art of record because the prior art of record does not teach the claimed subject matter including an arc to discharge continuously between the cathode and the anode; a target mounted to the cathode and having an erosion surface; and the erosion surface having a pattern of grooves, thereby causing a pattern of vapor flux to focus on a workpiece.

Art Unit: 1753

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M- Th with Every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Rodney G. McDonald
Primary Examiner
Art Unit 1753

RM
May 10, 2004